Goddard Space Flight Center SPI

GSFC

Implementing Process and Product Quality Assurance

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Software Process Improvement (SPI) Project

Agenda

- **Process and Product Quality Assurance (PPQA) Background**
  - **Overview**
  - **Benefits**
- **PPQA Implementation**
  - **Planning**
  - **Supporting**
  - **Monitoring**
  - **Acquisition**
- **Records and Tools**

Purpose and Objectives

- **Purpose: Describe PPQA Concepts and the implementation approach**
- **Objective: After this session you should understand:**
  - **Key functions of PPQA**
  - **How to plan and implement PPQA**
  - **Which records to maintain**
  - **Where to find additional information on PPQA processes and tools**

What Is Process and Product Quality Assurance (PPQA)?

- **PPQA provides the Product Development Lead (PDL) and project team with objective insight into processes and associated work products**
- **PPQA:**
  - **Provides objective evaluations**
  - **Identifies and documents noncompliances**
  - **Provides feedback to project staff and managers**
  - **Ensures that noncompliances are addressed**
  - **Maintains records of the quality assurance activities**

PPQA Benefits

- **Provides**
  - **Visibility into the maturity of software processes and products**
  - **Insight into project risks**
- **Promotes**
  - **Early detection of process and product weaknesses**
  - **Communication**

Quality is everyone's job!

PPQA Planning Considerations

- **Who will be responsible for these activities?**
- **Which processes and products will be evaluated?**
  - **Is there a minimum set of processes and products?**
  - **Where do you document them?**
- **Where will you capture and maintain results?**
- **How will you monitor/track noncompliances?**
- **Are there tools available?**

Who Performs PPQA Activities?

- **PPQA personnel must be separate from those directly involved in developing or maintaining a work product**
- **An independent reporting channel must also be available so that noncompliances can be escalated, if necessary**
- **PPQA support should be established early in the software life cycle (when the Product Development Team is formed)**
- **Software Quality Engineers (SQEs) from Code 300 provide PPQA support services. Contact Saul Harris, the Software Assurance Lead, to coordinate support**

PPQA Planning (1 of 2)

- **Include names of PPQA personnel (i.e., SQE's) on the project's organizational chart and process responsibility table in the SMP/PP**
- **Work with SQE's to identify the processes and products to be evaluated. At a minimum:**
  - **PPQA must audit every Level 2 process area 2 - 4 times a year (depending on the process area)**
  - **Product audits should include:**
    - SMP/PP
    - Software Requirements Specification
    - Requirements Traceability Matrix (RTM)
    - Version Description Documents (VDDs)/Release Notes

PPQA Planning (2 of 2)

- **Document planned process and product activities in the project's schedule and WBS, as well as in the SMP/PP or Software Quality Assurance Plan (SQAP)**
- **Include the list of records being maintained and their location in the project's Data Management List (DML)**
- **Identify all stakeholders with PPQA involvement**
- **Include SQE's in Process Training, as well as any tool training (e.g., software discrepancy tool, risk management tool)**

Supporting Objective Evaluations

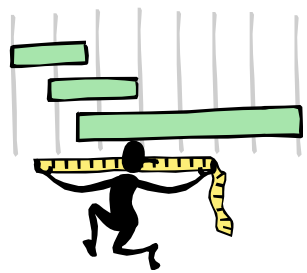
- **Provide the SQE all materials or access to the necessary materials for the audits**
- **Review and concur with all noncompliances/findings**
- **Resolve and track all findings and corrective actions to closure**
- **Regularly communicate/status results to all appropriate stakeholders via meetings or email**

  - Quality issues
  - Open/closed findings or observations
  - Overdue actions
  - Upcoming evaluations

Monitoring PPQA Activities

If you're the PDL or Acquisition Manager:

- **Include PPQA process area activities, status, and results in the project's Branch Status Review (BSR) or other separate report**
- **Update the project schedule to reflect completed assessments**
- **Measure PPQA activities such as**
  - Planned vs. actual effort for PPQA
  - Planned vs. actual process and product evaluations conducted
  - Process Efficiency (red, yellow, green)
- **Monitor open vs. closed findings**



Monitoring Examples (1 of 2)

Process Effort (in FTEs)

Monthly Effort by Process Area						Actuals As Of: Feb-08
Process Area	Planned Effort	Actual Effort	Variance	% Var.	Analysis	Corrective Plan
Management *Project Planning* *Project Monitoring and Control* *Measurement & Analysis* *Risk Management* *Acquisition Management*	0.30	0.56	-0.26	-87%	The effort required to perform management functions exceeded planned effort as a result of the work required to correct deficiencies identified during the CMMI appraisal.	No corrective action required
Configuration Management	0.02	0.00	0.02	100%	No CM this month.	No corrective action required
Process and Product QA	0.00	0.08	-0.08	0%	PPQA audits were done early.	No corrective action required
Engineering *Systems Engineering* *Dev & Test Environment Eng* *Requirements Development* *Requirements Management*	0.01	0.16	-0.15	-1500%	Covers Requirements Traceability Matrix update and derivation of new requirements from CR.	No corrective action required
Development	1.28	1.14	0.14	11%	Less effort was needed than planned to complete the software development activities.	No corrective action required
Verification and Validation	1.70	1.64	0.06	4%	Actual near Planned	No corrective action required

Monitoring Examples (2 of 2)

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Processes	Sufficient Staff?	Process Efficiency	Comments / Improvement Suggestions (*Date each entry; Entry is required when* RED)
Management			
Project Planning	🔴	🟡	01/28/08: Other duties prevent team from spending required amt of time
Project Monitoring & Control	🟡	🟡	01/28/08: Only partially implemented
Measurement & Analysis	🟢	🔴	01/28/08: Process not fully defined; not started
Risk Management	🟢	🟢	
Acquisition Management	🟢	🟢	
Configuration Management	🟢	🟢	
Process & Product QA	🟢	🟢	Audits have been conducted as planned
Engineering			
Systems Engineering	🟢	🟢	
Dev & Test Env Engineering	🟡	🟢	
Requirements Development	🟢	🟢	
Requirements Management	🟢	🟢	
Development	🟢	🟢	
Verification & Validation	🟢	🟢	

🟢 No issues 🟡 Small impact, inefficient process 🔴 Insuffici

← **Sufficient Staff and Process Efficiency**

<Project Name > Audit Findings and Corrective Actions

Report Date: 07/25/07

Total Findings Open: 1

Total Findings Closed: 3

Rec #	Audit Date	Process or Product Audit	Finding Description	Corrective Action (CA) Description	Assignee	Planned CA Due Date	Re-Assess-ment Date	Date Closed	Status
1	01/13/06	CM Plan	The CM Plan did not follow the designated template. Several sections (e.g., configuration audits, status accounting) were omitted	Revise the current CM Plan to adhere to ISD's template and include all required information	John Doe	04/05/06	04/06/06	04/06/06	MM/DD/YY: Status to date
2	06/01/06	RSKM Process	Risks have not been updated or monitored for 5 months. The Risk Management Plan (RMP) states that risks will be statused on a monthly basis	Risk Meetings need to resume on a monthly basis to monitor and status open risks	Jane Doe	07/01/06	08/05/06	08/05/06	08/05/06: Risk meetings were conducted for July and August and the risks have been statused appropriately 07/15/06: A Risk meeting was conducted on July 7th. Note: Consecutive meetings need to occur before this finding can be closed
3	06/01/06	RSKM Process	The project is not using the required 5x5 risk matrix (per the RMP)	Convert the current 3x3 matrix to a 5x5	Jane Doe	07/01/06	07/07/06	07/07/06	07/07/06: The matrix was successfully converted to the standard 5x5 risk cube
4	06/07/06	VDD	The VDD for Release 2.0 did not include all required information per the template	Update the VDD to include the list of Workarounds.	Jane Doe	06/12/06			08/13/06: Release 2.0 has been postponed until September 1st to include a new Severity 1 SPR. 07/01/06: Release 2.0 was held up and will be re-delivered 08/10

Open vs. Closed Findings →

PPQA & Acquisition

- **PPQA personnel also play a role in Software Acquisition**
- **Key activities include:**
  - **Assigning someone to objectively evaluate the Acquirer's acquisition processes and products, such as the Software Acquisition Management Plan (SAMP)**
  - **Providing project oversight to objectively evaluate the Supplier's processes and products, per the "agreement"**

PPQA Records

- The PPQA plan (i.e., the Software Quality Assurance Plan or section of the SMP/PP)
- Schedule and status highlighting PPQA activities (e.g., in the BSR)
- Documented audit results, including findings and corrective actions
- Communication of audit results (e.g., emails)
- Meeting minutes where PPQA is discussed
- Measurements of PPQA activity
- Team training records for the PPQA process

Summary of Tools

SPI Tools:

- **Go to http://software.gsfc.nasa.gov**
  - Quality Assurance Planning Section in the SMP
  - ISD Software Quality and IV&V Support Planning Guidelines
  - WBS Checklist Tool (for Quality Assurance items)

Code 300 Tools:

- **Go to http://sw-assurance.gsfc.nasa.gov**
  - Software Quality (SQ) Procedures and Work Instructions
  - Process and Product Checklists

Summary

- **Plan PPQA activities like all other activities**
- **Work with Code 300 to secure PPQA support personnel for your project**
- **Schedule and support continuous process and product audits**
- **Report PPQA activities, status, and results to upper management on a regular basis**
- **Ensure resolution and communication of noncompliances**

Questions?

Acronyms

BSR	Branch Status Review
DML	Data Management List
DMP	Data Management Plan
ISD	Information Systems Division
IV&V	Independent Verification and Validation
PDL	Product Development Lead
PP	Product Plan
PPQA	Process and Product Quality Assurance
RTM	Requirements Traceability Matrix
SAMP	Software Acquisition Management Plan
SMP	Software Management Plan
SPI	Software Process Improvement
SQ	Software Quality
SQAP	Software Quality Assurance Plan
SQE	Software Quality Engineer
VDD	Version Description Document
WBS	Work Breakdown Structure